ION IRRADIATION OF SULFURIC ACID: IMPLICATIONS FOR ITS STABILITY ON EUROPA. M.J. Loeffler[1], R.L. Hudson[1], and M.H. Moore[1]. Astrochemistry Laboratory, NASA Goddard Space Flight Center, Mail Code 691, Greenbelt, MD 20771, (mark.loeffler@nasa.gov).

Introduction: The Galileo near-infrared mapping spectrometer (NIMS) detected regions on Europa's surface containing distorted H_2O bands. This distortion likely indicates that there are other molecules mixed with the water ice. Based on spectral comparison, some of the leading possibilities are sulfuric acid [1], salts [2], or possibly H_3O^+ [3].

Previous laboratory studies have shown that sulfuric acid can be created by irradiation of H_2O-SO_2 mixtures, and both molecules are present on Europa [4]. In this project, we were interested in investigating the radiation stability of sulfuric acid (H_2SO_4) and determining its lifetime on the surface of Europa.

Experiment and Results: We prepared H_2SO_4 by irradiating H_2O-SO_2 mixtures and warming the irradiated sample to ~235 K, so the more volatile components left in the sample would evaporate. Once we obtained H_2SO_4, we cooled our sample and irradiated it with energetic protons. Figure 1 shows the evolution of sulfuric acid during irradiation with 800 keV protons at 86 K. We find that the pure sulfuric acid is destroyed, which produces SO_2, H_2O, H_3O^+, SO_4^-, and SO_3^- ions. More details on our results and further analysis will be presented at this conference.

References: [1] Carlson et al. (1999) Science, 286, 97-99. [2] McCord et al. (1998) Science, 280, 1242-1245. [3] Clark, R.N. (2004), LPI, Houston p. 16. [4] Moore, M.H. et al. (2007), Icarus, 189, 409-423.

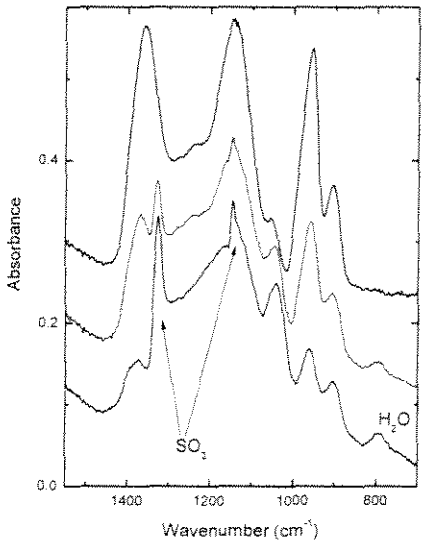

Figure 1. Irradiation of Sulfuric Acid with 800 keV protons at 86 K. Spectra from top to bottom are after a fluence (in units of 10^{15} ions/cm^2) of 0, 5.3, and 12.